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Applicant	: Wade A. Mattar	Art Unit	: 2856
Serial No.	: 10/729,990	Examiner	: R. Raevis
Filed	: December 9, 2003		
Title	: FLOWMETER ZEROING TECHNIQUES		

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
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REPLY TO ACTION OF JUNE 16, 2004

In response to the Office Action of June 16, 2004, please consider the following remarks.

Claims 1-38 are pending, and, of these, claims 3-14, 18-26, 29-35, 37, and 38 are currently withdrawn from consideration. Claims 1, 2, 15-17, 27, 28, and 36 have been examined, of which claims 1, 15, and 28 are independent.

Claims 1, 2, 15-17, 27, 28, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,272,438 to Cunningham et al. (Cunningham) in view of U.S. Patent No. 5,524,084 to Wang et al. (Wang). In response, Applicant respectfully submits that this rejection fails to establish a prima facie case of obviousness, and, therefore, requests that the rejection be withdrawn. Specifically, Applicant submits that no proper motivation has been shown for combining Cunningham and Wang, because Cunningham and Wang represent non-analogous art with respect to one another, and further because Cunningham teaches away from the proposed combination. Moreover, the rejection fails to establish a reasonable expectation of success for the proposed combination.

For example, independent claim 1 recites:

> A method of calibrating a flowmeter comprising:
> determining a plurality of calibration values (the calibration values specified in claim 2 to include zero-flow calibration values), the calibration values corresponding to measurements of material in a flowtube, the flowtube being associated with the flowmeter;
> associating each of the calibration values with one of a plurality of operational parameters of the flowmeter, each of the operational parameters being present during the determining of its corresponding calibration value; and

storing the calibration values in association with their respective operational parameters.

In rejecting claims 1 and 2, the Office Action takes the position that Cunningham discloses "a method to calibrate a flow meter including determining the zero offset error for correction of flow measurement. Cunningham then teaches that changes in temperatures may cause the zero offset to drift over time, necessitating compensation for the drift," and refers to column 2, lines 15-30.

The Office Action goes on to admit that "Cunningham does not associate calibration values (i.e., different zero values) with one of a plurality of operational parameters (i.e., a different temperature), and does not store those two values for calibration." Instead, the Office Action takes the position that Wang teaches (at column 5, line 31 to column 6, line 6) "that mass flow meters may be corrected for temperature variation by a determination of drift of offset with temperature," and that "it would have been obvious to correct flow meter measurements (with an equation) for temperature variations because Wang teaches that equations permit for flow meter signal correction for variation in temperatures" (see Office Action, page 2).

In response, Applicant submits that Cunningham appears to be exclusively concerned with "vibrating conduit parameter sensors," and, particularly, provides specific techniques for such sensors only with respect to Coriolis mass flow meters (see, e.g., column 1, lines 1-12). As such, Cunningham refers to "zero flow" in terms of zero phase difference or time difference between sensors placed along the vibrating conduit, since, for example, as is known with respect to vibrating conduit meters and as discussed in Cunningham, a phase shift between two such sensors may be proportional to the mass flow rate of the material through the conduit (see, e.g., column 1, lines 44-56).

In direct contrast, Wang does not appear to be at all concerned with "vibrating conduit parameter sensors," such as Coriolis flowmeters, and, instead, appears to be directed to mass flow sensors that include, for example, thermal mass meters, such as might be used during gas chromatography (see, e.g., FIGS. 4 and 5). Applicant submits that such thermal mass meters operate entirely differently from the "vibrating conduit parameter sensors" of Cunningham. For

example, such thermal mass meters may operate, generally speaking, based on the phenomenon that a rate of heat absorbed by a stream of flowing gas may be directly proportional to its mass flow. For example, resistance temperature detectors (RTDs) may be used to detect this phenomenon and determine a mass flow.

Specifically, Wang discloses in column 5 that a mass flow equation may be determined such that an output voltage $V_0 = \alpha[1-e^{\beta^f}] + V_{offset}$, and that a derivative of this equation may be used to determine a thermal drift. Wang discloses that the constant α is proportional to a heating bridge of the thermal mass meter, while the constant β is related to a thermal diffusivity of the fluid being measured. These constants are determined based on test measurements of a pneumatic manifold used with/as the thermal mass meter of Wang.

In light of the above, Applicant respectfully submits no proper motivation has been shown for combining Cunningham and Wang. In particular, Applicant submits that Cunningham and Wang represent non-analogous art with respect to one another. In determining whether references are non-analogous art, "similarities and differences in structure and function of the inventions" carry primary weight (MPEP 2141.01(a)). Here, as already pointed out, Cunningham is directed toward "vibrating conduit parameter sensors," such as Coriolis flowmeters, while Wang is directed toward thermal mass (flow) meters. Thus, the "structure and function" of a mass flowmeter in Cunningham relate to multiple sensors on a vibrating conduit or flowtube, the sensors having a phase difference between them that is proportional to a mass flow rate through the conduit. Meanwhile, the "structure and function" of a mass flow sensor of Wang include a thermal mass flow detection system that relies on a relation between a rate of heat absorbed by a stream of flowing gas and the mass flow rate of that gas.

As a result, an artisan of ordinary skill who was practicing the teachings of Cunningham, and who recognized from Cunningham the problem that "changes in temperatures may cause the zero offset to drift over time," would not have looked to Wang for a solution to this problem, because neither Wang nor Cunningham provides any indication of the applicability of equations governing thermal mass meters to vibrating conduit parameter sensors. For example, as pointed out above, the "zero offset" identified by Cunningham (i.e., a phase or time difference between

two sensors) is not discussed in Wang. Moreover, the only teaching of Wang for relating a temperature change to a voltage drift is the equation $V_0 = \alpha[1\text{-}e^{\beta^f}] + V_{offset}$, in which the constants α and β relate to parameters that have essentially nothing to do with vibrating conduit parameter sensors.

Additionally, and even if Cunningham and Wang were considered to be analogous art, Applicant submits that Cunningham teaches away from the proposed combination. Specifically, Cunningham discloses that a technique involving taking multiple measurements of (zero-flow) calibration values is disadvantageous and inconvenient, and goes on to disclose techniques for compensating mass flow measurements by determining "residual motion attributable to off-resonance contributions of (vibrational) modes," and then basing future mass flow compensations on this information.

In other words, Applicant submits that the position of the Office Action appears to be that Cunningham presents a problem, but that a practitioner of Cunningham would have disregarded Cunningham's disclosed solution to this problem, in favor of a technique that is ostensibly disclosed by Wang. Applicant submits that this position disregards, for example, M.P.E.P 2143.01, which requires that, "where the teachings of the prior art conflict, the Examiner must weigh the suggestive power of each reference," and that, "the proposed modification or combination of the prior art cannot change the principle of operation of a reference."

Moreover, the rejection fails to establish a reasonable expectation of success. That is, even if Wang discloses that equations relating temperature and voltage drift for a thermal mass meter, there is no teaching in Cunningham or Wang, whether taken alone or in combination, that discloses or properly suggests that such equations would be applicable to the vibrating conduit parameter sensors of Cunningham. Moreover, neither reference, alone or in combination, discloses or properly suggests that comparable equations exist for the vibrating conduit parameter sensors of Cunningham, or that practical and useful versions of equations could be developed for the sensors of Cunningham, without undue experimentation. Applicant submits that this shortcoming of the rejection is particularly apparent when one considers that, as referred

to above, the "zero offset" parameter of Cunningham (a zero phase or time difference between two vibrational sensors) is nowhere discussed, described, or suggested in Wang.

In conclusion, the Office Action takes the position that it would have been obvious to correct flow meter measurements with "an equation" for temperature variations, ostensibly because Wang discloses that equations permit for flow meter signal correction for variation in temperatures. In response, and as stated above, Applicant respectfully submits that this position is unreasonable and overly broad, because the Office Action does not identify "an equation" that would have (or could have) been used in Cunningham, nor does the Office Action provide any disclosure or suggestion that such "an equation" would have (or could have) been developed for the vibrating conduit parameter sensors of Cunningham, by a practitioner of ordinary skill at the time of the invention.

As a result, Applicant submits that such a practitioner of Cunningham would not have looked to Wang for techniques for compensating a drift in a zero offset, and, in any case, could not have done so without first disregarding the teachings of Cunningham. Moreover, even if such a practitioner had looked to Wang, in disregard of Cunningham, the practitioner would have had no reasonable expectation that the techniques of Wang could have successfully been applied to the sensors of Cunningham.

Based on the above, Applicant submits that no prima facie case of obviousness has been established, so that claims 1 and 2 are in condition for allowance for at least the above reasons, and claims 15-17, 28, and 36 are allowable for at least the same reasons. Moreover, since independent claims 1, 15, and 28 were indicated in the Restriction Requirement of May 4, 2004 to link remaining claims 3-14, 18-27, 29-35, 37, and 38, Applicant submits that all of claims 1-38 are in condition for allowance, and such action is hereby requested in the Examiner's next official communication.

Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: September 16, 2004

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